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Cost-Benefit Analysis of Radiation Therapy Services at Tripler Army Medical Center

A Graduate Management Project

Submitted to Dr. Karin Zucker

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ABSTRACT

The purpose of this analysis was to examine the costs and benefits associated with continuance of "in-house" radiation therapy services to eligible beneficiaries at Tripler Army Medical Center (TAMC), as opposed to purchasing services. In determining the optimal solution for TAMC, three models were developed and used to project, for FY04 through FY10, a financial analysis using historical data. The analysis indicated purchasing radiation therapy services, i.e., outsourcing this care would produce a cost avoidance of $442,683 to $604,619, depending upon model comparison. However, the financial data alone is insufficient to determine the optimal solution. Qualitative factors were analyzed using a relative values decision matrix. Evaluation criteria consisted of cost, access, perceived quality, measurable quality, and political views. These criteria were ranked and weighted. A threats, opportunities, weaknesses, and strengths matrix was then used to establish the strategic direction. Based on the results of this analysis, it is recommended that TAMC continue to provide radiation therapy services in-house and enhance those services through purchase of intensity-modulated radiation therapy technology.

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Cost-Benefit Analysis of Radiation Therapy Services at Tripler Army Medical Center

Introduction

Tripler Army Medical Center (TAMC or Tripler) opened at its present location in 1948. Through expansion, TAMC has become the military's largest tertiary medical treatment facility and the only referral center in the Pacific Basin, an area encompassing more than 52% of the earth's surface (Tippy, 2003). Two outlying clinics are under TAMC's command: U.S. Army Health Clinic Schofield Barracks, located approximately 20 miles North of TAMC, which supports the personnel of 25th Infantry Division (Light), their family members and retirees, and accounts for over 50% of TAMC's enrolled population; and Pohakuloa Training Area, located on the island of Hawaii (also known as the "Big Island") (Tippy, 2003).

Approximately 800,000 people are eligible to receive care at TAMC. Inpatient and outpatient care is provided to active duty beneficiaries of all military services, dependents of active duty, retirees, dependents of retirees, veterans (through a joint venture agreement), and residents of the Pacific Island Nations (Compact of Free Association, 1982). Tripler is a teaching facility providing graduate level programs in medicine, general surgery, otolaryngology, orthopedic surgery, psychiatry, pediatrics, obstetrics and gynecology, radiology, pathology, urology, oral surgery, hospital administration, and nursing anesthesia (Tippy, 2003). In 2000, The Veterans Affairs Pacific Island Health Care System became co-located with TAMC. In

conjunction with five community-based outpatient clinics on neighboring islands, the Veterans Affairs Pacific Island Health Care System provides outpatient medical and mental healthcare through its ambulatory care clinic. Tripler serves as the primary acute inpatient facility for veterans on Oahu. The joint venture program at TAMC accounts for 60% of all Army joint venture agreements (B. Horner, Program Analyst TAMC, personal communication, March 19, 2004).

Conditions That Prompted the Study

Implementation of Medicare and Medicaid in 1966 precipitated an escalation in healthcare costs throughout the United States. This led to a system-wide restructuring of healthcare delivery, to include payment mechanisms and the setting for the delivery of care. For the past two decades there has been an increase in the amount of healthcare being provided in outpatient settings. Sultz and Young (as cited in Sanders, 2001) "show that in 1980, outpatient services revenue constituted only 13% of total voluntary hospital revenues in the United States. That figure rose to 29.9% in 1995, and 35.3% in 1997" (see Figure 1).

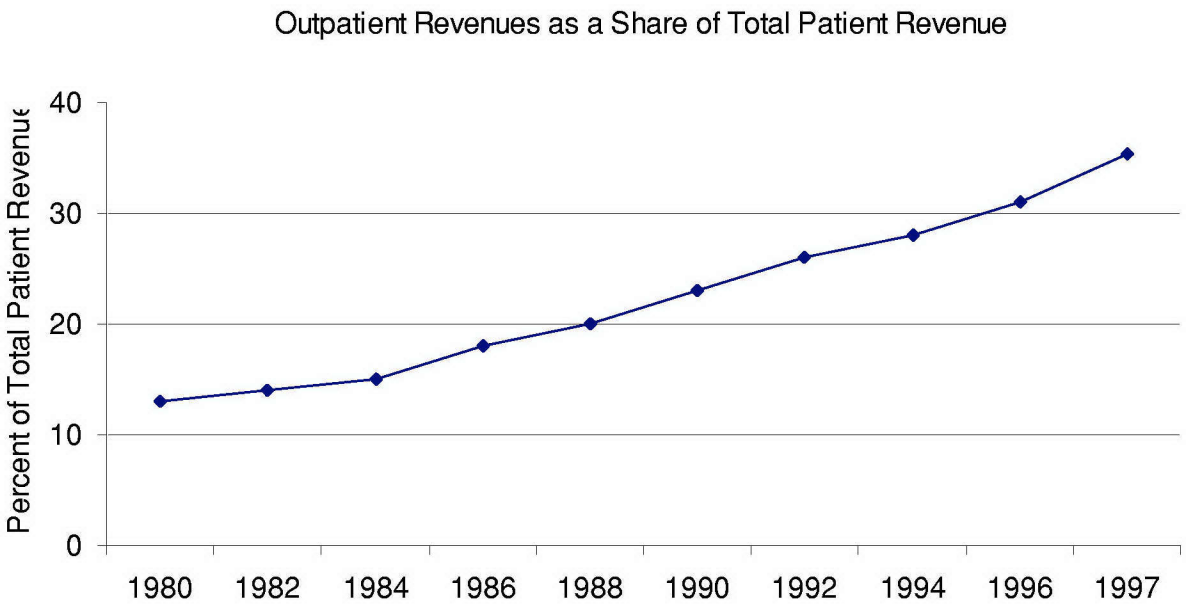

Figure 1. Outpatient Revenue as a Share of Total Patient Revenue, 1980-1997.
Note. Adapted from Sanders, 2001.

According to the Centers for Medicare and Medicaid Services (2003), the United States spent $1.4 trillion on healthcare in 2001, equating to 14.1% of the gross domestic product (GDP). "The 8.7% growth rate for 2001, compared with 7.4% in 2000 and 6.1% in 1999, marked the fifth consecutive year in which healthcare spending grew at an accelerating rate" (Center for Medicare & Medicaid Services, 2003, p. 1). If this trend continues, it is estimated that healthcare expenditures will rise to $1.6 trillion, consuming 15.2% of the GDP, by 2003 (Gapenski, 2001). Total funding by the private sector, the federal government, and state and local governments increased, as did the percentage contributed by the federal government; however, the percentage of total expenditures by private sources decreased (Gapenski, 2001). Growth in the number of outpatient services and the increase in healthcare expenditures are

attributed to multiple factors including technological advances, introduction of diagnostic related groups, aging of the population, and growth in managed care (Fox, 2001; Shi & Singh, 2001). Despite the shift from inpatient to outpatient care, the implementation of a prospective payment system, and a slight decline of cost in the mid-1990s as a result of managed care, healthcare costs are again on the rise. Supporting Gapenski's prediction, the Agency for Healthcare Research and Quality (2002) reported:

> The United States spends a larger share of its gross domestic product (GDP) on healthcare than any other major industrialized country. Expenditures for healthcare represent nearly one-seventh of the Nation's GDP, and they continue to be one of the fastest growing components of the Federal budget. In 1960, for example, health care expenditures accounted for about 5 percent of the GDP; by 2000, that figure had grown to more than 13 percent. (p. 1)

The Department of Defense (DoD) is also facing an increase in healthcare costs. According to a study by the Congressional Budget Office (2003), the DoD's annual spending on healthcare rose from $14.6 billion to $27.2 billion between 1988 and 2003. This study attributes the growth in spending to three factors. First, 56% of the growth is attributed to generally increasing healthcare costs, to include technological advancements, utilization patterns, and higher medical prices. Second, 41% is attributed to events not likely to occur again, such as

downsizing of the active duty force. Lastly, 3% is attributed to realignments within the DoD's healthcare system, resulting from the closure of hospitals, establishment of the TRICARE program, and new medical benefits (Congressional Budget Office, 2003).

Identifying ways to contain costs, improve efficiency, increase capacity and access, obtain return on investments, and maintain quality continue to be priorities for healthcare managers. In today's healthcare environment it would be irresponsible of managers to assume that past methods will satisfy future demands. Instead, healthcare managers should review established approaches, both within and outside the healthcare industry, and adopt those approaches that allow their organizations to become more cost-effective and efficient in the delivery of healthcare services. Additionally, these approaches need to be directly linked to the strategic mission, vision, and goals of the organization, with evaluative metrics being established to measure success.

One approach used by many industries is reorganization, defined by Cameron (as cited in Davis, Savage, & Stewart, 2003) as the "refocus of attention toward anticipated goals" (p. 182). Cameron also states that reorganization can be called downsizing, rightsizing, restructuring, reengineering, and/or productivity improvement. In light of a study conducted by Davis et al., it should be noted that the mindset equating reorganization with the elimination of personnel, positions, departments, product lines, or services may not be the most strategically viable approach to attaining the goals (cost-

effectiveness, efficiency, consumer satisfaction, improved employee morale, etc.) sought by managers. Referencing this issue, their study indicates that a lack of empirical data supporting reorganizing may ultimately not bode well for the consumer or for the organization. They do point out, however, that some reorganization may need to be undertaken in the future and that management has a responsibility to include methods of accomplishment in its strategic plans.

Reorganization is not a new concept to the military health system (MHS). Along with the rest of the healthcare industry, the MHS has shifted care from the inpatient to the outpatient setting. Additionally, the MHS continues to align resources to satisfy consumer demands while meeting strategic goals, controlling escalating healthcare costs, and improving efficiencies without negatively impacting the quality and access of healthcare. Within the context of its obligation to tax payers to be fiscally prudent, the MHS is continually challenged to improve efficiencies and be cost-effective. Outsourcing services has become an option used to meet that challenge, as has downsizing of hospitals to clinics and increasing the number of joint ventures.

The goal of this study is to provide the command with the facts necessary to make an informed decision regarding radiation therapy services. It does so by examining the quantitative, qualitative, and strategic factors associated with the delivery of radiation therapy services to eligible beneficiaries of TAMC.

Several circumstances prompted this analysis. First, reacting to a projected $6 million deficit in fiscal year 2003 (FY03), Tripler's management identified $2.3 million in budget decrements for FY03, reducing the projected deficit to $3.8 million. Then TAMC's Commanding General mandated control of staffing levels through a hiring freeze and an analysis of the organizational structure relative to personnel costs for FY04 and beyond. A goal was established to reduce overall personnel costs by 6%, requiring TAMC to direct finances to services that positively impact quality of care and the workplace (Webb, 2003). The resource management division provided written guidelines for developing a long-term reorganization plan (Dudevoir, 2003). A working program-budget-activity committee was formed to assist, track, monitor, and provide feedback relative to this process. Personnel responsible for product lines and budgetary activities were asked to identify and submit plans for an immediate 10% reduction of personnel costs. In response to these actions taken to control cost, the radiology department proposed closing the radiation oncology clinic and outsourcing services.

A second factor contributing to this analysis was the need to upgrade an existing linear accelerator purchased in 1998 and used to administer radiologic treatment. A medical care support equipment program requirements package has been submitted for this upgrade (M. Sprague, MD, Chief, Radiation Therapy TAMC, personal communication, September 24, 2003). This package totals $710,000 for the upgrade and $49,000 for annual maintenance.

The final factor contributing to this analysis was the desire to be proactive rather than reactive. Negotiating and outsourcing, i.e., entering into healthcare contracts, require methodical analysis and planning.

Statement of the Problem or Question

Tripler needs to determine the most cost-effective means of delivering radiation therapy services to its eligible beneficiaries.

Literature Review

Cancer and Radiation Therapy

Cancer is a group of diseases affecting the body's cells. Normally, cells divide without incident; however, when damage to a cell's DNA occurs, the result can be the rapid overgrowth of abnormal cells. These abnormal cells usually present as a tumor (lump or mass) and can spread to other parts of the body (American Cancer Society, 2003).

Between 1980 and 1997, cancer incidence rates in Hawaii increased by 13%, yet were less than the national rate per 100,000 population (Hawaii Medical Service Association, 2001). In 2003, the American Cancer Society estimated that, during the year, 1.3 million Americans would be diagnosed with cancer, including 4,900 in Hawaii (American Cancer Society, 2003). Of those 1.3 million, the American Cancer Society (2003) estimated 556,000 would die, including 2,000 in Hawaii, making cancer the second leading cause of death in the United States. Furthermore, "[c]ancer is projected to become the number one cause of death,

overtaking heart disease, within several years" (Americans for Medical Progress, n.d., p. 1).

Although the incidence rates differ between Hawaii and the rest of the nation, the options for treatment are the same. Radiation therapy is one approach used to treat certain types of cancer. It can be used alone or in combination with surgery, chemotherapy, and/or biological therapy. Based on factors such as tumor site, prognosis, stage (level of advancement), access to care, and anticipated resulting quality of life, the treatment is individualized for each patient. Research has assisted physicians in identifying which treatment or combination of treatments is most effective for the different types of cancer. Radiation therapy is commonly used for the treatment of certain brain tumors, lung cancers, head and neck cancers, breast cancers, prostate cancers, skin cancers, rectal cancers, cervix and uterine cancers, lymphomas, and sarcomas (21st Century Oncology, 2001).

Strategic Management

To ensure that healthcare needs are addressed, healthcare executives must incorporate strategic planning and management into the evaluation of services. The primary purpose of strategic management is attaining and sustaining a competitive advantage, with the goal of orchestrating a fit between the environment and the organization. The strategic management process arises within the organization's framework or is based on influences from the external environment, which includes both the general environment and the health care environment. These

environments interact with one another as well as the organization (Ginter, Swayne, & Duncan, 2002). There are four processes common to the external environment: *scanning*, *monitoring*, *forecasting*, and *assessing*.

Scanning identifies signals of environmental change that require an examination of the general and healthcare environments. Monitoring is the tracking of events, trends, and issues identified in the scanning process. The focus of monitoring is narrower than scanning, and its objective is to gather data on specific identified issues or events which could impact the organization. Forecasting is the extension into the future of what is learned through monitoring and assessment is the analysis of how the projections may impact the organization. Together, these four processes allow managers to visualize opportunities and threats to the organization, as well as to influence the strategy espoused by the organization (Ginter, Swayne, & Duncan, 2002).

Congress, concerned about the escalating cost of healthcare, is a key external factor in moving military healthcare in the direction of greater efficiency. Congressional mandates are driving federal health agencies to aggressively pursue opportunities to reduce costs, totaling 31.9% of all expenditures for healthcare goods and services (Gapenski, 2001); recognize efficiencies; and/or develop opportunities to share resources.

Once the issues, trends, and events relating to the general and healthcare environments are identified, a competitor

analysis should be conducted (Ginter, Swayne, & Duncan, 2002). The competitor analysis ("the process by which an organization attempts to further define and understand its service area through identifying its competitors, determining the strengths and weaknesses of these rivals, and anticipating their strategic moves" [Ginter, Swayne, & Duncan, 2002, p. 94]) as well as the internal environment analysis provide guidance for the strategic planning process within the organization.

Competitors providing radiation therapy services on Oahu include Queens Medical Center, Saint Francis Medical Center, Kuakini Medical Center, and Leeward Radiation Oncology. There are 11 practicing radiation oncologists on Oahu, eight that belong to a group practice and three that practice independently. Queens Medical Center administers approximately 140 – 150 radiation treatments per day, by far the largest volume on the island. They have three linear accelerators, two of which have intensity-modulated radiation therapy capability.

Intensity-modulated radiation therapy is a high *precision,* three-dimensional, conformal radiotherapy that uses computer-controlled x-ray accelerators to deliver precise radiation doses to a tumor or a specific area within the tumor. Treatment plans are developed through linking computer tomography images of the patient with treatment planning software, as well as computerized dose calculations, in determining the appropriate intensity pattern. By utilizing intensity-modulated radiation therapy, the ratio of normal tissue dose to tumor dose is

minimized. This makes it possible to administer not only a higher and more effective dose of radiation, but also a safer dose with fewer side effects to the patient (Radiological Society of North America, 2004). In addition to being a state of the art improvement in treatment, intensity-modulated radiation therapy has also contributed significantly to the return on investment as third party payers concur with its use and reimbursements are higher than for conventional radiation therapy services.

An internal environmental analysis conducted by the author found the TAMC radiation oncology clinic to be operating at capacity, based on its staffing level and hours of operation. The clinic is open 5 days a week, from 8:00 a.m. to 4:00 p.m. for consultations, simulator visits, weekly follow-up visits, and treatments. Staffing consists of one radiation oncologist, one dosimetrist, one registered nurse, one clerk, three radiation therapists, and a part-time physicist. Each treatment takes approximately 10-15 minutes, with each patient requiring treatment 5 times a week. The number of weeks of therapy varies by diagnosis and treatment plan. The infrastructure, equipment, and staff are in place to support current services. The author performed a strengths, weaknesses, opportunities, and threats analysis of TAMC's radiation oncology clinic (see Appendix A). The findings assisted the author in identifying evaluation criteria used to quantify factors that are qualitative in nature and are discussed in the results section.

Analyzing the external and internal environments assists managers in the development of directional strategies (mission, vision, values, and organizational goals), which feed into mission-critical activities, or objectives, which must be accomplished to achieve success. From here decisions can be made. Directional strategies provide a common impetus for all members of an organization and should motivate and guide them toward the organization's goals (Ginter, Swayne, & Duncan, 2002).

The task for the healthcare executive is to determine the best strategic alternative. "Within a framework provided by the mission, vision, values, and goals, the internal and external factors may be combined to develop and evaluate specific adaptive strategic alternatives using a threats, opportunities, weaknesses, and strengths matrix"(Ginter, Swayne, & Duncan, 2002, p. 269). Such a matrix was created for this study and is valuable in that it shows the alternatives an organization may develop. This matrix uses both quantitative and qualitative measurements for determining the correct strategic posture and position of the organization. To continually analyze services using the strategic management process, to apply best business practices, and to balance the numerous challenges to healthcare delivery, allows the organization to develop and sustain its competitive advantage.

The *Iron Triangle* of Healthcare

Access, quality, and cost are among the numerous challenges to the delivery of healthcare. These are often referred to as

the *iron triangle* of healthcare, and are, to some extent, interrelated. As these terms have multiple meanings in healthcare delivery, they warrant definition for the purposes of this paper. Access is the ability to obtain healthcare when needed and in a timely manner (Shi & Singh, 2001). Quality as defined by the Institute of Medicine is "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Shi & Singh, 2001, p. 502). Cost is the expense of producing goods and services (Stickney & Weil, 2000).

Access to healthcare was increased with the advent of Medicare and Medicaid in 1965 (Shi & Singh, 2001). Unfortunately, this precipitated an increase in its overall cost. Increased expenditures prompted attempts to curb them, and controls on utilization and provider payments were introduced through a prospective payment system and through managed care. While showing promise in controlling costs, these approaches began to be perceived as barriers to access, leading to the fear of an unending cycle of extending benefits and limiting expenditures. Intermingled with issues of access and cost were increased concerns over the impact of these factors on the quality of care (Barton, 1999). Thus, the challenge becomes finding a balance seen as effective, efficient, and equitable to users, providers, and payers.

The iron triangle also contributes to challenges within the MHS, where executives must learn to create a balance of good

outcomes and access, while maintaining fiscal solvency in a dynamic and ever-changing environment.

Access.

Within the MHS, access to care is based upon the status of the beneficiary and the medical need for care. Priority for specialty care is given to active duty members, followed by TRICARE Prime enrolled active duty dependents, non-active duty members (retirees), and their dependents, respectively. On a space available basis, specialty care is provided to TRICARE for Life and TRICARE Plus beneficiaries (the over 65 population), TRICARE Standard and Extra enrolled beneficiaries, Veterans Administration beneficiaries, Pacific Island Nation residents, and DoD civilians. Referral status based on need is also considered. The local civilian community does not prioritize care by beneficiary classification; it prioritizes by need and by ability to pay (P. Kendall, B. Pang, J. McGarry-Nakayama and P. Higgins, personal communication, January 30, 2004 [representatives of local community facilities]).

Data from October 1, 2003 to December 31, 2003 were used to determine the average time from specialty consultation to appointment. This sample showed a range of 0-31 days with an average of 8 days. Representatives of the local community state that the average wait time depends on need and patient desires; and, thus, varies from 1 to 14 days (P. Kendall, B. Pang, J. McGarry-Nakayama and P. Higgins, personal communication, January 30, 2004). In determining the comparative productivity of Tripler, the local civilian community, Madigan Army Medical

Center, and Brooke Army Medical Center, the average number of patients per day was multiplied by 250 (operational days/year), and then divided by the average number of providers assigned per day. Tripler averaged 4,800 visits in FY03 and is projected to average the same in FY04. Queens averaged 7,500, Kuakini 4,750, Saint Francis 4,500, and Leeward Radiation Oncology 7,750 visits. In comparison, each of the other military facilities averaged 3,750 visits.

Quality.

The ethereal nature of quality, with its many definitions, makes it a daunting issue to address. While not implying that any one model or definition is more precise or correct, this study employs Donabedian's structure, process, and outcomes model to measure quality indirectly. Each aspect is equally important, all are complementary, and all are used collectively in monitoring the quality of care (Shi & Singh, 2001).

The structure of TAMC's Radiation Oncology Clinic is similar to those in the local healthcare community. The facility is appropriately licensed and accredited; there is a trained and licensed staff; and the equipment, although not cutting edge, is fully functional.

The clinic's ancillary staffing is also comparable to that of like-Army facilities and local healthcare providers. Like-Army facilities employ two to four radiation therapists per accelerator at the equivalent pay grade of government service 8 to 10. The local healthcare providers employ three to five per accelerator. Tripler employs three (pay grade of government

service 8) radiation therapists per accelerator. Physician staffing is also comparable to the local healthcare community when the amount of workload per day is compared, but it is lower than the other three Army facilities in which radiation therapy services exist. The three other Army facilities have at least two radiation oncologists, either military or on contract, while TAMC has only one. The ramifications of having only one physician, without back-up, include delays in treatment (the Army's number one reported sentinel event [Powers, 2003]); increased costs to TAMC if patients need to be sent to another Army facility for treatment; and morale issues. This problem will be ameliorated if, as expected, a second active duty radiation oncologist is assigned to TAMC in June 2004 (M. Sprague, personal communication, September 24, 2003).

Another element of structure is equipment. Tripler currently provides radiation therapy using a linear accelerator, ". . . the device most commonly used for external beam radiation treatments for patients with cancer" (Radiological Society of North America, 2004, p. 1). A *uniform* dose of high-energy x-ray is delivered to the tumor location, which can result in the destruction of cancer cells (Radiological Society of North America, 2003). Tripler's acquisition of intensity-modulated radiation therapy technology would require an upgrade to the linear accelerator and a change in operating software. With this upgrade, the clinic will no longer need the current operating software; sensitometer; or the camera, processor, and chemical

mixer for x-ray films. Each piece of equipment except the chemical mixer has exceeded its life expectancy.

In assessing the current use of intensity-modulated radiation therapy in the United States, a study by Mell, Roeske, and Mundt (2003) found that in 2002, 32.1% of radiation oncologists currently use intensity-modulated radiation therapy in the treatment of cancer. This study also indicated that 45.4% of intensity-modulated radiation therapy nonusers planned to adopt this technology within 1-3 years; this means that 63.1% of radiation oncologists will have adopted the use of intensity-modulated radiation therapy by 2005 (Mell, Roeske, & Mundt, 2003).

Currently, three local healthcare facilities have the ability to offer intensity-modulated radiation therapy to their patients. The fourth local facility will adopt intensity-modulated radiation therapy within a year. Both Madigan Army Medical Center and Brooke Army Medical Center have intensity-modulated radiation therapy technology, leaving TAMC (a) technologically deficient, (b) at a competitive disadvantage, and (c) not meeting the standard of care.

Process, or the actual delivery of services, is multi-faceted and complex. Within TAMC, once a diagnosis of cancer is made, regardless of site, the patient is enrolled in a case management program. Tumor boards, comprised of individuals from different disciplines involved in the treatment of cancer patients, meet frequently to discuss every newly diagnosed patient and those currently receiving treatment. (W. Burkhalter,

MD, Chief, Department of Orthopedics TAMC; M. Chung, MD, Chief, General Surgery TAMC; D. Donovan, MD, Neurosurgery Staff Surgeon TAMC; J. Healy, MD, Plastic Surgery Staff Surgeon TAMC; J. Sniezek, MD, Residency Program Director, Otolaryngology TAMC, R. Stack, MD, Chief, Department of Surgery TAMC, R. Sutherland, MD, Chief, Urology TAMC, G. Underwood, MD, Pulmonary Staff Physician TAMC, personal communication, February 2004). Decisions and recommendations are made regarding the current status, appropriate treatment plan, and coordination of these plans between disciplines. As mentioned previously, potential reorganization may include the outsourcing of services. Being cognizant of this, personnel on tumor boards are concerned that should radiation therapy services be outsourced, the civilian radiation oncologist(s) may be disinclined to attend tumor boards regularly, thereby impacting the overall quality and multidisciplinary coordination of care.

Variation in practice is also a determinant in the process of providing care and in the outcomes achieved. In the civilian community, every extra minute spent with a patient, or in meetings, equates to lost revenue for the provider and/or institution. Consequently, they may be more focused on technology as a benefit to the business side of providing healthcare.

As previously mentioned, three local healthcare facilities have purchased intensity-modulated radiation therapy technology. In addition, third party payers agree with its use and pay a higher reimbursement rate when it is utilized than they do for

conventional treatment. Therefore, civilian providers, attempting to recover expenses, are prone to use intensity-modulated radiation therapy technology as extensively as possible (E.Price, personal communication, September 2003 [TAMC's physicist]). While fiscal responsibility is of importance in the MHS, it does not have the same emphasis as in the civilian community. Time spent with patients is regarded as an opportunity to address patient concerns whether medical, psychological, financial, and/or spiritual in nature, contributing to the patient's overall well-being and supports a major component of TAMC's mission, graduate medical education.

According to Tallman (2002), the "ability to reduce radiation doses to the visual apparatus, spinal cord, and salivary glands" (p. 1) has contributed to the adoption of intensity-modulated radiation therapy for head and neck cancers. Tallman (2002) also states that morbidities induced by radiation can significantly reduce quality of life for patients, but all tumors do not need intensity-modulated radiation therapy. In comparison to the local community, TAMC plans to use this technology for a limited number of diagnoses (specifically head, neck, and brain cancers).

Tripler's professional staff made many arguments against outsourcing radiation therapy. These arguments, not all grounded in fact, included the following. The training and graduation of residents in some specialty programs may be affected (W. Burkhalter, M. Chung, J. Sniezek, R. Sutherland, personal communication, February 2004). Outsourcing radiation therapy

would limit the number of teaching cases, as the Pacific Island Nations program allows a patient to be seen at TAMC only if all care can be provided within this facility (J. Sniezek, personal communication, February 2004). The Center of Excellence status for the ear, nose and throat residency program may be more difficult to achieve without in-house radiation therapy services (M. Sprague, J. Berenberg, personal communication, February 10, 2004; April 8, 2004). Future accreditation by the Commission on Cancer may be more difficult to achieve without in-house radiation therapy (M. Chung, J. Berenberg, personal communication, February 4, 2004; April 8, 2004). Additionally, patients could develop a negative perception of TAMC (i.e., it does not provide state of the art healthcare). The staff physicians could experience difficulty in following patients, and a decrease in quality could result. A loss of efficiency might well also follow any decrease in continuity of care. Further, there would be less access to a multidisciplinary comprehensive care team. Patients and referring physicians could experience a longer waiting time for emergency consultations. Communication issues between facilities, providers, staff, and/or patients could arise (J. Berenberg, W. Burkhalter, M. Chung, D. Donovan, J. Healy, J. Sniezek, R. Stack, R. Sutherland, G. Underwood, personal communication, February 2004). Moreover, TAMC staff related anecdotal information indicating that the measurable quality of care in the network would be less than if care were provided in-house, but quantitative data to support this are absent. In fact, patients

currently outsourced for radiation treatment are seen more frequently for follow-up visits (J. Sniezek, personal communication, February 2004), adding to the expense TAMC incurs.

Upon further research, it was discovered that the residency review committees do not require in-house radiation therapy for graduate medical education programs offered at TAMC. Additionally, there is no direct agreement between TAMC and the Pacific Island Nations to provide healthcare (D. Person, MD, Director, Pacific Island Nations Program TAMC, personal communication, February 25, 2004). A Compact of Free Association and Related Agreements Between The Republic of the Marshall Islands and The United States does exist however, and states:

> To the extent that appropriate services can be made available consistent with available resources and the laws and regulations of the United States, the Government of the United States shall provide, at the request of the Government concerned, medical care to citizens and nationals of Palau, the Marshall Islands and the Federated States of Micronesia in United States military medical facilities of by United States military medical personnel on a reimbursable basis under terms and conditions agreed upon between the Government of the United States and the Government concerned. (p. 294)

Accessing healthcare is a challenge for the Pacific Island Nation population. Many live on remote islands and have to travel several hundred miles by boat for even marginal medical

care. Additionally, weather conditions limit travel to certain times of the year. Access to healthcare on their islands is also limited by their ability to pay. It is not uncommon for the Pacific Island Nation population to have advanced staging of cancer upon acceptance by the Pacific Island Nation's program medical director into TAMC's healthcare system.

Congress annually authorizes and appropriates some funding to support healthcare for the Pacific Island Nation population. This serves as a source of revenue and supports teaching case requirements for TAMC. However, funding for this program has declined from $8 million to $4.5 million between 2000 and 2003 (S. Long, Chief, Program & Budget Branch, Resource Management Division TAMC; D. Person, MD, Pacific Island Nation Program Medical Director TAMC, personal communication, November 25, 2003; February 25, 2004). Additionally, due to limited monies and questionable measurable quality benefits, the Medical Director of the Pacific Island Nations Program will not use appropriated funds for outsourced radiation therapy (D. Person, personal communication, February 25, 2004). According to TAMC's Center Judge Advocate, the terminology used in the Compact of Free Association and Related Agreements Between The Republic of the Marshall Islands and The United States is "gray and open to interpretation." He agrees with the Pacific Island Nation Program Medical Director's interpretation of the terminology and supports his decision not to use appropriated funds to outsource radiation therapy. Therefore, outsourcing radiation therapy

services would negatively impact access to this type of care for this category of patients.

Cost.

As stated earlier, U.S. healthcare expenditures are rising and consuming a growing percentage of the gross domestic product. Significant pressure from Congress to control expenditures, while concurrently increasing access and improving the quality of care, reinforces the fact that money is a scarce resource. Healthcare executives are responsible for allocating resources to services that support the organizational mission, vision, and values. They must assess and balance information regarding access, quality, and cost in their strategic decision-making process. Cost-benefit, cost-effectiveness, and business case analyses are available to healthcare executives for assessment; however, disparities exist in the methods and reporting formats employed (Weinstein, Siegel, Gold, Kamlet, & Russell, 1996). To adequately address cost, one needs to gain an understanding of cost accounting and the various methods used in the decision-making process.

Cost Accounting

Cost accounting permits organizational managers to plan and control operations. Planning allows management to analyze potential business undertakings, provides insight as to a project's viability, and exposes managers to all implications of that undertaking. Additionally, it allows those same managers to allocate resources that are directed toward capital investments which support organizational mission, vision, and values. The

goal of such a planning process is to make sure organizations have the opportunity to achieve maximum potential as measured by financial decision criteria, e.g., net present value, in addition to qualitative factors. Ensuring that the organization reaches its potential constitutes the control process (Finkler & Ward, 1999). In this study, the costs to deliver radiation therapy services, access to those services, perceived and measurable quality, and political views will serve as the evaluation criteria.

A cost analysis should be performed to ensure that a project is financially feasible. The analysis should consider expected gains (revenues) and the costs of producing those gains (expenses) (Finkler & Ward, 1999). Cost analyses combine the elements of capital and operational budgets, consider all revenues and expenses, and incorporate cash flow implications in determining a proposed project's profitability (Finkler & Ward, 1999). Two evaluation tools managers frequently utilize in the decision-making process are the breakeven and profitability analyses.

Breakeven analysis permits managers to gain insight into the risk and profitability of projects. Utilization breakeven analysis measures how much volume must be produced to achieve breakeven operations over a specified time, such as weekly or annually (Gapenski, 2001). Time breakeven analysis determines the amount of time required to recapture investment (Gapenski, 2001). The time breakeven analysis is further broken down into payback and discounted payback analyses. The focus on risk is

one advantage of the payback method, the sooner the initial investment is recaptured the less risk is associated with a project. Additionally, the shorter the payback, the sooner invested funds are available for other investments. Additional advantages of the payback method include applicability of the method for projects which incur both positive and negative cash flows and the relative ease of understanding. The disadvantages of the payback method are its lack of attention to cash flows after the payback period occurs and its disregard of the time value of money (Gapenski, 2001). The second option, discounted payback analysis, eliminates the latter disadvantage but does not differentiate between competing projects and may still result in discarding projects which add economic value (Gapenski, 2001).

Profitability is measured utilizing two methods: in dollars, using net present value, or in percentage rate of return, using internal rate of return (Gapenski, 2001). Both methods utilize discounted cash flow which converts future cash flow streams into their present value. Discounting reduces future cash flows by applying a determined factor (Finkler & Ward, 1999). The discount rate used by both the Medical Command, and local command for business case analyses is 2.1% (Office of Management and Budget, 2003).

In determining expected profitability using net present value, the net present value (NPV) is "the difference between the present value of the cash inflows and the present value (PV) of the cash outflows: NPV = PV inflows – PV outflows" (Finkler &

Ward, 1999, p. 181). If the net present value is positive, the capital investment is considered profitable. However, this still includes some subjectivity because the discount rate employs attempts to adjust for uncertainty and, therefore, risk, by selecting an appropriate required rate of return (Finkler & Ward, 1999). Advantages of the net present value method include its propensity to identify projects that add economic value while rejecting those that erode value; its ability to evaluate projects with both positive and negative cash flows; its consideration of the time value of money; its ability to differentiate between competing projects; and its most redeeming attribute, that it works every time (B. Walker, LTC(R), MSC, U.S.-Army Baylor faculty member, personal communication, January 12, 2003). The disadvantage is its complexity, making it both difficult to understand and difficult to explain (Gapenski, 2001).

Internal rate of return is the other method used to determine expected profitability. Here, instead of forecasting a required rate of return, internal rate of return ". . . determines the rate of return that the investment earns. This is accomplished by finding the rate at which the present value of the inflows is exactly equal to the present value of the outflows" (Finkler & Ward, 1999, p. 182). Once this rate is known, managers can determine the expected profitability of a project. If the interest rate for money borrowed for the capital investment is less than the internal rate of return, the investment is considered profitable. Conversely, if the interest

rate for borrowed money is higher than the internal rate of return, the investment is not profitable. Advantages of the internal rate of return include its understandability, its consideration of projects that add economic value, and its consideration of the time value of money. The primary disadvantage of internal rate of return is that it is not applicable for either all positive or all negative cash flows (Gapenski, 2001).

Purpose

The purpose of this study is to determine the optimal way to deliver radiation therapy services to eligible beneficiaries of TAMC. Three possibilities will be considered: (a) maintaining the current level of services provided while adding one radiation oncologist, (b) enhancing in-house services through purchase of intensity-modulated radiation therapy technology, and (c) purchasing radiation therapy services. The hypothesis is that providing enhanced radiation therapy services in-house is the optimal solution.

Method and Procedures

The method for this study involved two steps. The first step was an economic analysis, and the second was a comparison of quantitative and qualitative factors. The results of the economic analysis were measured using the net present value. A relative values decision matrix using both quantitative and qualitative evaluation criteria was ranked and weighted and the result identified the best course of action. First, current business practice (the *status quo model)*, was compared with

outsourcing (the *purchased care model)*. The second matrix compared the status quo model with enhanced services (the *inclusive cost model)*. The outcomes of these two matrices were compared in a third matrix, the purchased care model was compared with the inclusive cost model. A threats, opportunities, weaknesses, and strengths matrix was then used to establish strategic direction.

Data Sources

Data on radiation therapy units of service, encounters, expenses, purchased care, Civilian Health and Medical Program for the Uniform Services (CHAMPUS) Maximum Allowable Charges, and billing were gathered from available sources. Data on units of service were obtained from a series of ad-hoc reports of the Composite Health Care System and placed in Microsoft Access for data queries. These data served as the base of the current procedural terminology (CPT) and evaluation and management (E&M) units and utilization by patient category and age. These data were then imported into Microsoft Excel®, allowing for analysis, manipulation, and comparison.

The source for expense data from FY02 and FY03 was the Medical Expense Performance Reporting System (MEPRS), a congressionally mandated Tri-Service system used to identify and manage healthcare costs. The Management Analysis and Reporting Tool, which provided summary and detailed data in customized formats, was used to acquire historical data relative to the number and types of services purchased from the network and

claims pertaining to radiation therapy services during FY02 and FY03.

Current procedural terminology and evaluation and management codes were identified through the American Medical Association's CPT® 2004 Professional Edition Manual and through ad-hoc report data from the Composite Health Care System. Throughout the United States, CPT is the preferred method of describing and coding healthcare services (Beebe et al., 2003). The CHAMPUS maximum allowable charges for CPT and E&M codes were obtained through a TRICARE website http://www.tricare.osd.mil/cmac/CmacDetails.cfm. Data on Veterans Administration reimbursement, for services provided at TAMC, were gathered through TAMC's joint venture program. Data on third party insurance, and reimbursement from the Coast Guard and Pacific Island Nation Program were identified through TAMC's Uniform Billing Office.

Numerous assumptions were made for this study: (a) Units of service, expenses, and revenues would remain as projected; (b) the current radiation oncologist would not be replaced if the service was outsourced; (c) the position of the current registered nurse and the medical clerk would be reassigned within TAMC; (d) all Veterans Administration encounters would be reimbursed at the agreed upon fee-for-service rate; (e) Tripler would not recapture TRICARE Standard and Extra patients with the acquisition of intensity-modulated radiation therapy technology as this population has chosen to utilize the network for their healthcare needs; (f) a portion of E&M codes identified as 99499 were coded as such due to lack of documentation; however, with

proper documentation, each such visit would have been billed as one of five codes (99211-99215); and (g) Congress would continue to authorize and appropriate funding for the Pacific Island Nation residents. It should also be noted that there is risk associated with the first assumption because the further one projects from known data points, the less accurate predictions become. Additionally, at some unpredictable point, visits will level off instead of continuing to increase.

All studies have limitations; however, awareness of these limitations aids the reader in judging the study's validity (Cooper & Schindler, 2001). Limitations of this study include (a) no data were obtained on outsourced VA radiation therapy services, despite numerous requests on the part of this author; (b) salvage value of equipment was not considered; (c) professional fees for network costs were not identified in the Management Analysis and Reporting Tool data; and (d) information from local community, Madigan Army Medical Center and Brooke Army Medical Center was based on personal communication and, thus, not quantitatively validated.

Three models were developed and used to compare projected costs for radiation therapy services from FY04 through FY10: (a) a status quo model, reflecting current operations, with an additional provider (scheduled to arrive in June 2004); (b) a purchased care model, reflecting outsourcing radiation therapy services; and (c) an inclusive cost model, reflecting enhanced services provided with intensity-modulated radiation therapy technology. Purchased care estimates were based on reimbursement

at 100% of CHAMPUS maximum allowable charges for FY03. An average cost rate of CPT/E&M from FY99 through FY03 produced an annual growth rate of 3% (see Appendix B), which was applied annually through FY10. Additionally, cost for an additional 114 visits coded as 99499 was determined by averaging the costs of E&M codes 99211-99215.

The method for determining costs was based on CPT and E&M units versus visits normally used in military costing models. This is consistent with the workload and reimbursement method used in the civilian healthcare system. Inconsistencies found in Veterans Administration billing and reimbursement may have been due to manual entry and the administrative process of ensuring documentation, authorization, and coding prior to reimbursement. These inconsistencies could cause considerable delays, creating an unreliable method for matching encounters and reimbursement per FY. Therefore, it was assumed all Veterans Administration encounters were reimbursed at the rate agreed upon by Tripler and the Veterans Administration.

Status quo model

The status quo model represented the current business practice within TAMC with the projected addition of one provider starting in June 2004. Purchased care dollars paid in FY03 were summed, multiplied by a 3% annual growth rate for FY04 through FY10 and added to the direct, ancillary, and support expenses to obtain the total expenses of providing care. Subtracting expenses from revenues determined annual net cash flows. Annual

net cash flows were discounted at a rate of 2.1% to obtain a project net present value.

Purchased care model

This model represented the outsourcing of radiation therapy services. The number of CPT and E&M units were a reflection of those beneficiaries for which TAMC is responsible: active duty, active duty dependents under age 65, non-active duty dependents under age 65, dual eligible veterans under age 65, and individuals over age 65 (at 20% CHAMPUS maximum allowable charges). Dual eligible veterans were defined as those beneficiaries retired from active service who, due to service connected disabilities, were also eligible for Veterans Administration services. The percentage of dual eligible veterans was determined, using FY04 data, by dividing the number of eligible beneficiaries by the sum of the number of TRICARE enrollees and the number of Veterans Administration enrollees, which resulted in 2.32% of this population being identified as dual eligible. The total of each CPT and E&M unit utilized by the Veterans Administration was multiplied by this percentage to identify TAMC's potential financial obligations.

Results of a study conducted by Mell, et al. (2003), on the current usage level of intensity-modulated radiation therapy in the United States (63.1%), were applied to the relevant CPT codes (77261-77263 and 77401-77416) to estimate the amount of TAMC workload that would be coded as intensity-modulated radiation therapy units (77301 or 77418). Steps for the application included (a) determining total units of service

associated with each CPT code, (b) multiplying the total units of service per CPT code by best practice metric percentage (63.1%) to determine intensity-modulated radiation therapy units of service, and (c) applying the remaining units of service (a-c) as the adjusted TAMC CPT Codes. See Table 1 for radiation therapy planning (77301) or Table 2 for radiation delivery (77418).

Table 1

Estimating Intensity-Modulated Radiation Therapy Planning

CPT Code	Units of Service		Percentage	New CPT code (77301)		Adjusted TAMC CPT Code	
	<65	>65	63.1%	<65	>65	<65	>65
	(A)		(B)	(C)		(D)	
				sum(AxB)		(A-C)	
77261	4	5	63.1%			1	2
77262	0	1	63.1%			0	0
77263	52	41	63.1%			19	15
77301				36	30		

Table 2

Estimating Intensity-Modulated Radiation Therapy Delivery

CPT Code	Units of Service		Percentage	New CPT code (77418)		Adjusted TAMC CPT Code	
	<65	>65	63.1%	<65	>65	<65	>65
	(A)		(B)	(C)		(D)	
				sum(AxB)		(A-C)	
77401	0	0	63.1%			0	0
77403	33	21	63.1%			12	8
77404	4	8	63.1%			1	3
77406	8	0	63.1%			3	0
77408	9	0	63.1%			3	0
77409	6	1	63.1%			2	0
77412	1	0	63.1%			0	0
77413	913	434	63.1%			337	160
77414	558	604	63.1%			206	223
77416	0	0	63.1%			0	0
77418				967	674		

Purchased care costs were determined by multiplying the total number of each CPT or E&M unit by the CHAMPUS maximum allowable charges, which produced a total cost per CPT or E&M. These costs were then summed. To project the cost per CPT or E&M for FY04 through FY10, the FY03 rate was multiplied by an annual 3% growth rate. Purchased care dollars paid in FY03 were also

multiplied by a 3% annual growth rate to estimate FY04 through FY10 costs, and then added to the above. The loss of revenue from reimbursement not recovered from the Veterans Administration, third party health insurance, the Coast Guard, and the Pacific Island Nation Program was added as an expense. Avoidable costs were determined through identification of those positions TAMC would be unable to absorb (radiation therapists, dosimitrists, oncologists, and physicist). Expenses for direct supplies were also included as avoidable costs. These avoidable costs were subtracted from the cost of purchasing care to determine the total costs associated with outsourcing radiation therapy services. Annual net cash flows were discounted at a rate of 2.1% to obtain a project net present value.

Inclusive cost model

The inclusive cost model represented enhanced current operations through acquisition of intensity-modulated radiation therapy technology. With intensity-modulated radiation therapy, TAMC would recapture a portion of service units currently being outsourced. Variable costs incurred for those units, along with the costs of the units TAMC would not recapture, were added as an expense, which produced total expenses of providing care. Variable costs were determined by totaling the FY03 direct, ancillary, and support supply expenses and dividing by the number of service units to establish a cost per unit. This cost was then multiplied by the number of units TAMC would recapture. Other health insurance, Veterans Administration, Coast Guard, and Pacific Island Nation reimbursements were estimated by

multiplying the FY03 reimbursements by the 5.2% annual average Medicare growth rate. The FY05 through FY10 cost for those units TAMC would recapture, based on a 3% annual growth rate, was added as a cost avoidance of providing rather than purchasing care. Subtracting expenses from revenues determined annual net cash flows. Annual net cash flows were discounted at a rate of 2.1% to obtain a project net present value.

Determining the willingness and capability of the local civilian community to absorb radiation therapy services workload was previously discussed as it related to the iron triangle of healthcare. The economic analysis outcomes were used as an evaluation criterion in the decision-making process.

Calculations

A trend analysis, using FY02 and FY03 as known data points, was attempted to determine units (CPTs and E&Ms) and expenses for FY04 through FY10. However, due to a change in the method of coding visits at TAMC, and the function of trend analysis ("returns numbers in a linear trend matching known data points using least squares methods" [Microsoft Excel®, trend function]), negative numbers resulted. Therefore, to project units of service for FY04 through FY10, each CPT and E&M in FY03 was multiplied by 3%, representing the annual growth rate (with 3% representing the average increase in workload from FY01 to FY03, according to historical data from the Composite Health Care System Clinic Workload Report). Data from 47 encounters were discarded due to the absence of a CPT or E&M code. Direct,

ancillary, and support expenses were determined as addressed below and are displayed in Appendix C.

Tripler currently owns the required equipment to provide most radiation therapy services; therefore, those expenditures were considered sunk costs, i.e., costs already incurred which would not affect the decision to accept or decline a project (Finkler & Ward, 1999). However, TAMC does have equipment that needs upgrading. The additional expenditures for these upgrades were included in this analysis.

Direct expenses.

Civilian personnel costs in FY04 were projected using the government service pay scale, with a 25% cost-of-living allowance over base pay, and a 25% benefits adjustment over base pay. Military staffing costs were determined using the DoD military personnel composite standard pay and reimbursement rates. The cost of contract staff was estimated by multiplying cost-per-hour by the number of hours worked per week, and then by the number of weeks to be worked. All other FY03 direct expenses, using MEPRS data, were multiplied by a 4% growth rate, the average projected increase, and added to personnel costs.

In determining FY05 direct expenses, all FY04 expenses, except personnel costs and contract hours, were multiplied by 4%, the aforementioned estimated growth rate. Personnel costs were multiplied by 2%, the average growth rate from FY03 to FY04. If intensity-modulated radiation therapy technology were to be operational in October 2004, the planning time required by the physicist would be approximately double that now required.

Therefore, the projected contract hours were doubled, and the cost to acquire intensity-modulated radiation therapy technology was added to direct expenses. For FY06 through FY10, direct expenses were determined by increasing the previous year's expenses by 4%, representing the projected growth rate, except for personnel costs which were multiplied by 2%, representing the projected growth rate there.

Ancillary expenses.

To determine FY04 through FY10 total ancillary expenses, ancillary personnel expenses were multiplied by 2%, the projected growth rate. All other ancillary expenses were multiplied by 4%, the projected growth rate.

Support expenses.

Support personnel expenses were multiplied by 2%, the projected growth rate. All other support expenses were multiplied by 4%, the projected growth rate. This determined the total support expenses for FY04 through FY10. Additionally, annual maintenance costs for the upgrade to intensity-modulated radiation therapy technology of $49,000 were added to the inclusive cost model beginning in FY06 (purchase of this technology would include a 1-year warranty which would cover all maintenance expenses).

Decision matrix

A relative values decision matrix was utilized that addressed the quantitative and qualitative factors using the models as courses of action. The prime fact bearing on the project was the Commanding General's guidance to reduce overall

facility personnel costs. Evaluation criteria were identified as (a) cost-containment, defined as the amount of dollars needed to provide or purchase services; (b) access, defined as the ability to obtain healthcare when needed and in a timely manner (Shi & Singh, 2001); (c) perceived quality, defined as the degree of excellence perceived by the patient; (d) political views, defined as opportunities to reduce costs, recognize efficiencies, and/or develop opportunities to share resources; and (e) measurable quality, defined as compliance with given standards. These criteria were ranked and weighted with cost being ranked first, and therefore, weighted most heavily. Access and perceived quality were ranked second and third, respectively. Since, in the author's opinion, the consumer is not able to judge quality without access, access was weighted more heavily than perceived quality. Political views were ranked fourth, and weighted accordingly. As stated previously (based on perceptions of TAMC staff), measurable quality of care provided in the network is less than that provided in-house; to capture this belief the researcher maintained measurable anecdotal quality in this model and weighted it with the lowest value.

Ethical Considerations

The use of Management Analysis and Reporting Tool and Composite Health Care System encounter data presented ethical challenges to the protection of patient information and privacy. Both these systems contained patient information requiring protection. System administrators limit access through network log-ins and passwords. For this study, to protect patient

information, data contained encounter numbers or pseudo-sponsor numbers. Data quality presented an additional challenge, as addressed below.

Data Quality

The author acknowledges that the quality of data obtained by using the Management Analysis and Reporting Tool and Composite Health Care System was suspect. During the course of this study, data sources were found to be inconsistent. As an example, the joint venture office recorded Veterans Administration reimbursement for 266 radiation therapy encounters during FY02. While the Veterans Administration recorded 27 reimbursed encounters, Tripler's billing office had record of 46 reimbursed encounters. Inconsistencies were found between data sources for workload, procedures, and utilization by patient category. For this study, the number of data sources was minimized to overcome this barrier and to portray the comparison of costs as accurately as possible.

Validity and Reliability

Validity is defined by Cooper & Schindler (1998) as "the extent to which a test measures what we actually wish it to measure" (p. 210). The decision matrix tool has been utilized throughout the military for a number of years. The net present value, a measure of profitability, is a widely used financial tool. Both tools reflect a high degree of criterion-based validity. Reliability, according to Cooper & Schindler, (1998) "has to do with the accuracy and precision of a measurement procedure" (p. 210). Cost data from the radiation oncology

clinic were obtained from the MEPRS, which provides managers with a standardized reporting mechanism through consistent financial and operating performance data (Great Plains Regional Medical Center, 2003).

> Medical Expense Performance Reporting System is a cost management system that accumulates and reports expenses, manpower, and workload performed by DoD fixed military medical and dental treatment facilities. It is the basis for establishing a uniform reporting methodology that provides consistent financial and operating performance data to assist managers who are responsible for health care delivery (Great Plains Regional Medical Center, 2003).

Tripler MEPRS cost data are reconciled and validated monthly (D. McGue, Chief, Medical Expense Performance Reporting System Section Program Analysis & Evaluation Branch, Resource Management Division TAMC, personal communication, November 26, 2003). In order to reduce researcher error, all data were electronically extracted then imported into a Microsoft Excel® spreadsheet for manipulation, calculation, and presentation.

Results

Economic Analysis

Over the 7-year period, at a discount rate of 2.1%, the status quo model resulted in a negative net present value of $8.21 million (see Appendix D). This means that continuing current operations with two providers would cost TAMC approximately $1.2 million per year. Over 56% of this cost was attributed to direct expenses, of which 93% was personnel costs.

Additionally, 34% of the total cost was incurred in support expenses, of which 69% was personnel costs. On a positive note, over the 7-year period, projected total costs rose by only $300,000. Climbing reimbursements over the same period assisted in keeping total net costs down. However, studies indicate that the MHS, as a whole, continually lost revenue as a result of reimbursement processes not being enforced or managed (Government Accounting Office, 2004). For example, in FY02, TAMC billed other health insurance $38,598 and received $18,125 in payment, which equated to a collection rate of only 47%. The 53% not collected, if grown at the 5.2% annual average Medicare rate, would have reduced total costs over the 7-year period by an additional $167,000.

The inclusive cost model produced a negative net present value of $8.53 million over the 7-year period (see Appendix E). A majority of this cost was attributed to personnel costs and the costs associated with purchase of intensity-modulated radiation therapy technology. The model denoted a change in services offered; and, thus, the impact of marginal costs was considered. According to Finkler and Ward (1999), marginal costs are represented by "the change in total cost related to a change in patient volume or in services offered. These include variable costs and any additional fixed costs incurred because the volume change exceeds the relevant range for existing fixed costs" (p. 13). While one provider handled the present units of service with the intensity-modulated radiation therapy services outsourced, procuring intensity-modulated radiation therapy

technology and adding a second provider would result in cessation of outsourcing, and an increase in units of service. A concern was whether the increase in units of service would be at a level resulting in the relevant range, i.e., the capacity level of the provider being too large, necessitating additional fixed costs, or too small, thereby increasing per unit costs. Concurrently, there was concern whether the amount of the increase in service units justified adding a second full-time provider.

Given this information, the researcher had to determine if acquisition of intensity-modulated radiation therapy technology was cost-effective. The change in total costs was $320,638 over the six-year period (FY05-FY10). While the change in total costs was based on all radiation therapy treatments, projected usage of intensity-modulated radiation therapy would be limited to head, neck and brain cancers. Therefore, marginal costs relative to this population were examined and compared to network claims paid in FY03. Approximately 70 patients were treated, either within TAMC or as outsourced patients, for a diagnosis related to head, neck, or brain cancer during FY03. The estimated total costs of intensity-modulated radiation therapy technology with maintenance costs, variable costs of supplies, and increased personnel expense through FY10 were $2,077,081, or $4,945 per patient. This was compared to a range of $3,000 to $28,458 paid per patient in the network. The disparity may be indicative of the different treatment plans, i.e. palliative versus curative or of the time lag in submission and payment of network claims.

Costs associated with CPT codes added to the difficulty in ascertaining the true costs attributed to services purchased in the network as the data showed different prices for the same code. This disparity might be because the CHAMPUS will pay additional charges listed using revenue codes at "reasonable rates". Additionally, Management Analysis and Reporting Tool data did not identify the class of provider or reflect E&M codes specific for radiation therapy; thus, true costs of purchased care was misrepresented.

With the data from the status quo model, the purchased care model resulted in a negative net present value of $7.76 million (see Appendix F); and, using the inclusive cost model data, the purchased care model resulted in a negative net present value of $7.93 million (see Appendix F). There were dollar savings associated with purchasing services for only those beneficiaries for which TAMC was responsible. This savings was readily attributed to a reduced population and cost avoidance of personnel expenses. However, those savings were less when compared to the inclusive cost model due to the recapturing of workload and collecting of insurance reimbursement. Further, the net present value of this model, without adjusting the E&M code of 99499, would have been a negative $7.72 million and $7.88 million respectively, signifying the importance and need for proper documentation. With this model, remaining fixed costs currently absorbed by radiation therapy services would be spread across the rest of the organization, increasing their unit costs and would not result in organizational savings.

Decision Matrix

A relative values decision matrix determined the purchased care model to be the optimal solution when compared to the status quo model (see Appendix G). A second relative values decision matrix determined the inclusive cost model to be the optimal solution when compared to the status quo model (see Appendix G). Therefore, the status quo model was eliminated as a viable course of action. A third relative values decision matrix established the inclusive cost model as being the optimal solution (see Appendix G). Though the process of elimination led to an academic solution, the long-term strategic direction of any decision must be considered prior to implementation.

Strategic Impact

The threats, opportunities, weaknesses, and strengths matrix supported the strategic alternative of product-development from the future quadrant (see Appendix H). Ginter et al., (2002) define product-development as "improving present products or services or extending the present product line" (p. 253). Organizations in the future quadrant maximize their strengths (comprehensive cancer care, access, readiness, reputation, cutting edge technology, quality/skilled personnel, and research contributions) while taking advantage of external opportunities (disjointed care locally, aging population, congressional mandates, increases in cancer incidence rate, healthcare spending, and outpatient services) (Ginter, Swayne, & Duncan, 2002). As previously stated, the external and internal analyses, in combination with the mission, vision, and values, drive

strategy, define scope of service, and identify a long-term picture. Therefore, product-development through expansion is the best strategy in support of TAMC's mission and vision.

Discussion

Comparing the cost of delivery of radiation therapy services provided in the local community with the cost of providing those services at TAMC seems straightforward. However, the difference in costing methodologies made computation extremely challenging. Using units-of-service rather than visits as a commonality allowed this difference to be overcome. Lack of accurate documentation, resulting in non-billable E&M codes, also added to the challenge. This was resolved with the assistance of in-house coders who taught the researcher how to identify those units-of-service coded 99499 as a result of a lack of documentation, as well as a method of averaging costs for these episodes. A study by Mell et al. (2003) that determined the current usage of intensity-modulated radiation therapy in the United States was used to more accurately reflect the cost of purchasing this care.

Negative net present values in military facilities are not unusual; DoD facilities are to be fiscally responsible, but are not to seek profits. Adding to the negative net present value is the fact that a majority of military beneficiaries do not carry third party insurance and, therefore, are not a source of reimbursements.

Comparison of the purchased care model with the inclusive cost and status quo models led to savings requiring explanation.

A key element leading to savings was the cost avoidance associated with purchased services, the largest components being manpower and equipment. Volume also played a role in the savings. In the purchased care model, TAMC is financially responsible for only a portion of eligible beneficiaries. Therefore, addressing the healthcare needs of this reduced population (excluding the veterans, Pacific Island Nation residents, and all but 20% of the cost for the over 65 population), expenditures were expected to be lower. Volume savings associated with the inclusive cost and status quo models were relative to efficiencies gained from economies of scale. The more units of service provided, the lower the cost per unit (Finkler & Ward, 1999). In other words, if a service is operational and there is capacity, an organization should capitalize on the available market through agreements or joint ventures up to the point of meeting, but not surpassing, the relevant range.

A limitation of this study was the lack of data concerning care outsourced by the Veterans Administration. Inclusion of this data in the inclusive cost model through recapture of workload would have increased expenses for additional supplies; however, the revenues gained from reimbursement would have outweighed the costs. This would have resulted in reduced annual net cash flows and, thus, would reduce the net present value, potentially changing the financial results of this study.

Additionally, organizational cultural issues are present that exacerbate the financial position of military healthcare.

The military has fostered, through the years, a belief that if dollars remain at the end of each fiscal year, budgets will be decremented the following year. In other words, incentives to be cost-effective were believed to be punitive in nature. Recently, however, initiatives to curtail this perception and foster a culture that is cost-effective, efficient, and equitable, while maintaining quality and access and instilling accountability for dollars, have been instituted. Accountability, scarce resources, increasing healthcare costs, governmental push for cost-containment, efficiency, and cost-effectiveness, have all contributed to this mindset. Although, according to Nolan (2003), "TAMC and the VA have agreed, during their strategic planning session, to nurture a culture with single unity of purpose in which all redundant systems would be joined to reduce duplicate administrative costs and recognize efficiencies for federal healthcare dollars" (p. 50), TAMC's Commanding General, is ultimately the decision maker and is accountable for the delivery of healthcare at TAMC, within the means/budget provided. Simply put, the Commander has the final say. At the same time, mechanisms to hold over dollars from one FY to the next are non-existent. Unless military treatment facilities can have, and control, multi-year dollars, any incentive to be cost-effective is absent. It will require legislative action to ameliorate this financial disincentive.

Conclusion and Recommendations

The optimal solution for TAMC is to enhance radiation therapy services through acquisition of intensity-modulated

radiation therapy technology and provide these services to eligible beneficiaries in-house. Beneficiaries would benefit from the access, quality, and continuity of care. Congressional mandates would be met and economies of scale gained through sharing of resources with the Veterans Administration. Additionally, the intensity-modulated radiation therapy technology would serve to (a) ensure the standard of care is met, (b) strengthen the reputation of TAMC as a premiere healthcare facility, (c) ensure the most favorable learning opportunities for residents, and (d) maintain competitive parity.

Some recommendations which may prove of even greater value to the future of the MHS are that (a) third party collections be pursued through accurate tracking models, ensuring that appropriate reimbursements are realized; (b) the ranking and weighting of intangibles, relative to cost, need to be determined as a matter of policy, thus adding validity to similar studies; and (c) a federal database containing cost-benefit, cost-effectiveness, and business case analyses be developed to allow for the capture and dissemination of lessons learned, comparisons, and consistencies, supporting strategic planning goals.

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Appendix A

Strengths, Weaknesses, Opportunities, and Threats Analysis

Strengths	Weaknesses
- Accredited Comprehensive Cancer Care Center - Multidisciplinary coordination and communication in developing plan of care and decision making - Quality of and skilled personnel -Reputation of care/brand loyalty -Tertiary care provider -Radiation oncologists on-site -Research contributions -Indirectly supports GME program -Supports political directional view	-No "Go To War" mission -High operational costs -Operates in a deficit -Less than cutting edge technology -Reimbursement process
Opportunities	**Threats**
- Demands for easy access and quality of care -Congressional mandates -Increase in cancer incidence rate -Increase in healthcare spending -Increase in outpatient services -Aging population -Disjointed cancer care locally	-Intensity-modulated radiation therapy technology growth in community -Multiple local sites offering service (competition) -Government focus of cost-containment -Annually increasing deficit -Potential Budget cuts -Increasing incidence rate -Low percentage of beneficiaries with third party insurance

Appendix B

Determination of Average Civilian Health and Medical Program for the Uniform Services Maximum Allowable Charges Rate

CPT/E&M Code	Rate	Rate	Rate	Rate	Rate	Global Rate
	FY99	FY00	FY01	FY02	FY03	
31575	$133.83	$144.46	$164.15	$162.17	$168.52	
57410	$98.55	$130.59	$162.05	$179.27	$173.91	
77261	$75.97	$78.10	$80.67	$74.76	$75.14	
77262	$115.40	$118.44	$121.97	$112.23	$113.23	
77263	$171.25	$176.54	$181.17	$167.30	$167.53	
77280	$191.54	$197.76	$199.30	$175.14	$183.77	*
77285	$302.56	$313.06	$313.99	$277.35	$291.36	*
77290	$372.19	$384.91	$386.26	$341.10	$357.80	*
77295	$1,478.45	$1,531.86	$1,537.76	$1,354.08	$1,424.40	*
77300	$92.67	$95.61	$96.92	$86.12	$89.18	*
77305	$120.20	$124.63	$125.28	$110.66	$115.77	*
77310	$159.53	$164.88	$166.15	$147.80	$153.92	*
77315	$202.29	$208.39	$210.03	$187.46	$194.22	*
77321	$229.89	$237.75	$239.00	$210.70	$220.73	*
77326	$154.97	$160.07	$161.13	$143.07	$148.69	*
77327	$228.37	$235.72	$238.12	$211.12	$219.51	*
77328	$331.88	$342.40	$345.61	$306.64	$319.47	*
77332	$88.67	$91.40	$92.20	$81.72	$84.69	*
77333	$129.49	$133.21	$134.95	$119.68	$124.93	*
77334	$210.18	$216.98	$218.91	$194.52	$202.22	*
77336	$131.60	$136.22	$136.46	$119.07	$126.79	
77370	$154.04	$159.44	$160.09	$139.21	$148.07	
77401	$78.17	$81.55	$81.66	$71.07	$75.53	
77403	$78.17	$81.55	$81.66	$71.07	$75.53	
77404	$78.17	$81.55	$81.66	$71.07	$75.53	
77406	$78.17	$81.55	$81.66	$71.07	$75.53	
77408	$92.06	$95.75	$96.14	$83.58	$89.07	
77409	$92.06	$95.75	$96.14	$83.58	$89.07	
77412	$103.00	$106.93	$107.07	$93.24	$99.30	
77413	$103.00	$106.93	$107.07	$93.24	$99.30	
77414	$103.00	$106.93	$107.07	$93.24	$99.30	
77416	$103.00	$106.93	$107.07	$93.24	$99.30	
77417		$27.04	$27.51	$23.69	$25.32	
77418			$657.18	$657.17	$746.38	
77427	$181.24	$171.57	$182.70	$172.10	$172.00	
77762	$461.84	$479.84	$487.24	$438.43	$449.26	*
77763	$651.38	$675.84	$687.62	$625.57	$634.46	*
90782	$4.85	$5.11	$5.20	$4.37	$4.85	
92511	$69.24	$72.89	$85.60	$86.55	$88.79	
96400	$18.46	$15.69	$12.97	$10.71	$42.07	

Appendix B Continued

CPT/E&M Code	Rate FY99	Rate FY00	Rate FY01	Rate FY02	Rate FY03
J9217					$611.56
J9218					$24.93
99202	$58.54	$68.64	$65.74	$64.60	$65.65
99203	$80.97	$95.59	$96.68	$96.35	$97.08
99204	$118.15	$137.73	$140.20	$136.64	$138.03
99211	$18.06	$22.59	$21.83	$21.90	$18.91
99212	$32.70	$37.50	$38.60	$38.41	$32.83
99213	$44.84	$51.17	$53.95	$53.16	$45.92
99214	$61.23	$63.17	$63.84	$64.54	$71.53
99215	$83.34	$85.70	$87.67	$87.67	$104.10
99220	$157.32	$162.05	$166.37	$154.36	$155.62
99221	$75.19	$74.08	$74.37	$66.83	$67.50
99222	$120.87	$121.71	$121.89	$110.98	$111.95
99223	$156.58	$162.05	$166.47	$154.87	$155.72
99231	$38.46	$37.94	$37.46	$33.47	$33.60
99232	$57.05	$58.76	$59.56	$55.03	$55.50
99233	$79.96	$82.48	$84.47	$78.38	$78.83
99234	$124.08	$132.12	$140.26	$133.56	$134.07
99235	$169.75	$178.97	$157.10	$176.59	$177.38
99236	$205.79	$219.39	$200.61	$219.86	$221.77
99241	$54.17	$61.16	$53.16	$49.53	$49.92
99242	$86.07	$98.87	$94.66	$91.18	$92.25
99243	$110.34	$125.77	$125.10	$121.25	$121.97
99244	$153.22	$173.05	$176.59	$171.49	$173.03
99245	$202.90	$224.21	$230.79	$221.80	$224.15
99251	$51.98	$47.60	$44.65	$35.60	$35.77
99252	$80.94	$80.91	$80.90	$71.61	$71.95
99253	$107.24	$108.20	$109.15	$97.69	$98.45
99254	$147.49	$150.99	$154.35	$140.51	$141.55
99255	$199.60	$205.75	$211.02	$193.63	$194.69
99354	$99.99	$112.25	$126.07	$125.10	$127.12
99355	$98.34	$109.22	$119.45	$116.14	$118.02
99357	$96.19	$97.85	$98.18	$89.16	$89.78
Total	$10,640.68	$11,163.29	$11,966.53	$11,016.05	$12,085.57
Difference (Sum) Between Years		$522.61	$803.24	($950.48)	$1,069.52
Sum/Higher Total		4.68%	6.71%	-7.94%	8.85%
% Increase/Year Trend				12.30%	3.08%

Professional: Services normally performed by a physician usually for an interpretation of a diagnostic test.

charges usually for equipment, technician services, supplies and materials used during test.

Global: Sum of Professional and Technical charges

Appendix C

Total Medical Expense Performance Reporting System Expenses For FY04 Through FY10

Status Quo Model				
Fiscal Year	Direct Expenses	Ancillary Expenses	Support Expenses	Total Expenses
FY04	$678,174.51	$134,626.81	$436,617.21	$1,249,418.53
FY05	$765,306.98	$138,024.23	$447,927.46	$1,351,258.67
FY06	$781,570.57	$141,517.79	$459,567.03	$1,382,655.39
FY07	$798,197.73	$145,110.54	$471,546.64	$1,414,854.91
FY08	$815,197.26	$148,805.65	$483,877.37	$1,447,880.28
FY09	$832,578.21	$152,606.37	$496,570.70	$1,481,755.28
FY10	$850,349.85	$156,516.09	$509,638.54	$1,516,504.48
Inclusive Cost Model				
Fiscal Year	Direct Expenses	Ancillary Expenses	Support Expenses	Total Expenses
FY04	$678,174.51	$134,626.81	$436,617.21	$1,249,418.53
FY05	$1,552,106.98	$138,024.23	$447,927.46	$2,138,058.67
FY06	$888,306.57	$141,517.79	$508,567.03	$1,538,391.39
FY07	$907,636.45	$145,110.54	$520,546.64	$1,573,293.63
FY08	$927,415.48	$148,805.65	$532,877.37	$1,609,098.49
FY09	$947,655.14	$152,606.37	$545,570.70	$1,645,832.21
FY10	$968,367.24	$156,516.09	$558,638.54	$1,683,521.87

Appendix D

Status Quo Model Profitability Analysis

2.1% Rate								
		1	2	3	4	5	6	7
Revenues		FY04	FY05	FY06	FY07	FY08	FY09	FY10
	VA	$209,647.01	$227,021.10	$246,145.89	$266,645.79	$288,988.88	$312,934.64	$339,006.32
	CHI	$20,059.46	$21,102.56	$22,199.89	$23,354.28	$24,568.71	$25,846.28	$27,190.28
	Coast Guard	$899.19	$945.94	$995.13	$1,046.88	$1,101.32	$1,158.59	$1,218.83
	PIN	$4,821.33	$5,072.04	$5,335.78	$5,613.24	$5,905.13	$6,212.20	$6,535.23
Total Revenue		$235,426.99	$254,141.64	$274,676.69	$296,660.20	$320,564.04	$346,151.71	$373,950.67
Expenses								
	Direct	$678,174.51	$765,306.98	$781,570.57	$798,197.73	$815,197.26	$832,578.21	$850,349.85
	Ancillary	$134,626.81	$138,024.23	$141,517.79	$145,110.54	$148,805.65	$152,606.37	$156,516.09
	Support	$436,617.21	$447,927.46	$459,567.03	$471,546.64	$483,877.37	$496,570.70	$509,638.54
	Network	$154,606.27	$159,244.45	$164,021.79	$168,942.44	$174,010.71	$179,231.03	$184,607.97
Total Expenses		$1,404,024.80	$1,510,503.12	$1,546,677.18	$1,583,797.35	$1,621,890.99	$1,660,986.32	$1,701,112.45
Net Cash Flows		($1,168,597.81)	($1,256,361.48)	($1,272,000.48)	($1,287,137.15)	($1,301,326.95)	($1,314,834.61)	($1,327,161.78)
Net Present Value	($8,210,411.55)							

Appendix E

Inclusive Cost Model Profitability Analysis

2.1% Rate								
		1	2	3	4	5	6	7
Revenues		FY04	FY05	FY06	FY07	FY08	FY09	FY10
	VA	$209,647.01	$227,021.10	$246,145.89	$266,645.79	$288,988.88	$312,934.64	$339,006.32
	OHI	$20,059.46	$21,873.21	$23,804.40	$25,859.82	$28,046.65	$30,372.46	$32,845.23
	Coast Guard	$899.19	$945.94	$995.13	$1,046.88	$1,101.32	$1,158.59	$1,218.83
	PIN	$4,821.33	$5,072.04	$5,335.78	$5,613.24	$5,905.13	$6,212.20	$6,535.23
	Network	$0.00	$99,674.03	$102,664.25	$105,744.18	$108,916.50	$112,184.00	$115,549.52
Total Revenue		$235,426.99	$354,586.32	$378,945.45	$404,909.91	$432,958.48	$462,861.89	$495,155.14
Expenses								
	Variable Costs	$0.00	$5,330.30	$5,543.51	$5,765.25	$5,995.86	$6,235.70	$6,485.12
	Direct	$678,174.51	$1,552,106.98	$888,306.57	$907,636.45	$927,415.48	947,655.14	968,367.24
	Ancillary	$134,626.81	$138,024.23	$141,517.79	$145,110.54	$148,805.65	152,606.37	156,516.09
	Support	$436,617.21	$447,927.46	$508,567.03	$520,546.64	$532,877.37	545,570.70	558,638.54
	Network	$154,606.27	$59,570.43	$61,357.54	$63,198.27	$65,094.21	$67,047.04	$69,058.45
Total Expenses		$1,404,024.80	$2,202,959.39	$1,605,292.44	$1,642,257.14	$1,680,188.56	$1,719,114.94	$1,759,065.44
Net Cash Flow		($1,168,597.81)	($1,848,373.07)	($1,226,346.98)	($1,237,347.23)	($1,247,230.08)	($1,256,253.06)	($1,263,910.31)
Net Present Value	($8,534,448.92)							

Appendix F

Purchased Care Model Profitability Analysis

Status Quo Model

2.1% Rate	FY04	FY05	FY06	FY07	FY08	FY09	FY10
	1	2	3	4	5	6	7
Net Cash Flows	($971,001.39)	($976,465.62)	($1,061,075.10)	($1,151,390.60)	($1,248,149.08)	(1,351,395.30)	(1,461,955.23)
Net Present Value	($7,526,173.13)						

Inclusive Cost Model

2.1% Rate	FY04	FY05	FY06	FY07	FY08	FY09	FY10
	1	2	3	4	5	6	7
Net Cash Flows	($971,001.39)	($1,076,910.30)	($1,165,343.85)	($1,259,640.31)	($1,360,543.52)	(1,468,105.48)	(1,583,159.70)
Net Present Value	($8,129,233.35)						

Appendix G

Decision Matrix

Purchased Care Model vs Status Quo Model

Weight	4.00	3.00	2.50	2.00	1.00	Total
Criteria / COA	Cost	Access	Perceived Quality	Political Views	Measurable Quality	
Purchased Care Model	1	2	2	1	1.5	18.50
Status Quo Model	2	1	1	2	1.5	19.00
						Relative Values Matrix Less is Better

Inclusive Cost Model vs Status Quo Model

Weight	4.00	3.00	2.50	2.00	1.00	Total
Criteria / COA	Cost	Access	Perceived Quality	Political Views	Measurable Quality	
Inclusive Cost Model	2	1	1	1	1.5	17.00
Status Quo Model	1	2	2	2	1.5	20.50
						Relative Values Matrix Less is Better

Inclusive Cost Model vs Purchased Care Model

Weight	4.00	3.00	2.50	2.00	1.00	Total
Criteria / COA	Cost	Access	Perceived Quality	Political Views	Measurable Quality	
Inclusive Cost Model	2	1	1	1	1.5	17.00
Purchased Care Model	1	2	2	2	1.5	20.50
						Relative Values Matrix Less is Better

Appendix H
Threats, Opportunities, Weaknesses, and Strengths Matrix

	STRENGTHS	WEAKNESSES
1	Accredited Comprehensive Care Center	No "Go To War" mission
2	Multidisciplinary coordination and communication in developing plan of care and decision making	High operational costs
3	Quality of and skilled personnel	Operates in a deficit (Expenses outweigh revenues)
4	Reputation of care/brand loyalty	Less than cutting edge technology
5	Tertiary care provider	Reimbursement process
6	Radiation oncologists on-site	
7	Research contributions	
8	Indirectly supports GME program	
9	Supports political directional view	

OPPORTUNITIES	FUTURE QUADRANT	INTERNAL FIX-IT QUADRANT
1 Demands for easy access, and quality of care	Related Diversification	Retrenchment
2 Congressional mandates	Vertical Integration	Enhancement
3 Increase in cancer incidence rate	Market Development	Market Development
4 Increase in healthcare spending	Product Development	Product Development
5 Increase in outpatient services	Penetration	Vertical Integration
6 Aging population		Related Diversification
7 Disjointed cancer care locally		

THREATS	EXTERNAL FIX-IT QUADRANT	SURVIVAL QUADRANT
1 IMRT technology in community		
2 Multiple local sites offering service (competition) and have excess capacity	Related Diversification	Unrelated Diversification
3 Government focus of cost-containment	Unrelated Diversification	Divestiture
4 Annually increasing deficit (fiscal solvency)	Market Development	Liquidation
5 Potential budget cuts	Product Development	Harvesting
6 Low percentage of beneficiaries with third party insurance	Enhancement	Retrenchment
7 Low usage if purchase new technology (means high dollar/pt tx plan)	Status Quo	